Working from the same page
consistent messages for CDEM

PART B: Hazard-specific information

Damage from the Gisborne earthquake, December 2007

Earthquakes

- **Learn if earthquakes are a risk in your area by contacting your local council.**
- **Information about earthquake risk is also available on the GNS Science website at www.gns.cri.nz.**

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In this chapter

CORE ACTION MESSAGES IN THIS CHAPTER (pp6–10)

- **Pick safe places in each room.**
- **Practice drop, cover and hold.**

For general preparedness, every household should create and practice a Household Emergency Plan and assemble and maintain Emergency Survival Items and a Getaway Kit. In addition, every household should take earthquake-specific precautions and plan and practice what to do in the event of an earthquake.

- **Make sure your home and critical buildings are securely anchored to their foundations.**
- **Secure heavy objects both inside and outside the home.**
- **If you are outside, find a clear spot and drop to the ground.**
- **If you are inside when the shaking starts, move no more than a few steps to a safe place and drop, cover and hold.**
- **Expect aftershocks.**
- **Check yourself and then others.**
- **Look for fires.**

Please note: Core Action Messages should be read in conjunction with the rest of the text in this chapter.

Awareness messages

Why talk about earthquakes?

Earthquakes happen every day in New Zealand. Instruments record the ground shaking from over 14,000 earthquakes in and around the country each year. Most are too small to be noticed, but between 150 and 200 are big enough to be felt. On a world scale, seismicity (earthquake activity) in New Zealand varies from moderate to very high. Wellington lies in one of the most active of New Zealand's seismic regions and Auckland in one of the least active. Christchurch and Dunedin are in areas of intermediate activity.

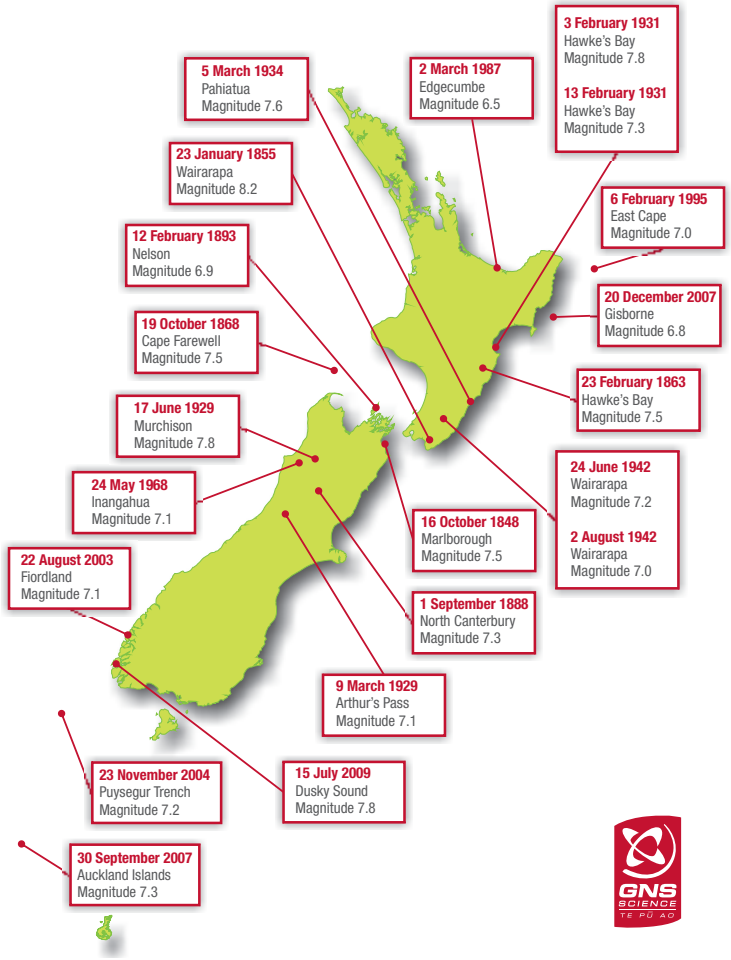

Figure 1 Large shallow earthquakes in New Zealand 1840–2009 (GNS Science)

The locations of major shallow earthquakes (M>6.5) that have occurred in New Zealand since 1840 are shown in Figure 1. We have clearly been very fortunate during the last 50 years that nearly all of the earthquakes with magnitude larger than 7 have been well away from urban areas, either offshore from East Cape or from Fiordland. Only the 1968 Inangahua earthquake was on land, and that was centred in a sparsely populated area.

In contrast, during the preceding hundred years, there were near-direct hits on what are now the major centres of Wanganui, Napier/Hastings and Wellington. Losses could exceed $1 billion if those earthquakes were to occur today. Wellington is particularly vulnerable, but other high-risk towns include Palmerston North, Napier, Hastings and Masterton.

Awareness messages

What are earthquakes and what causes them?

An earthquake is a sudden, rapid shaking of the earth caused by the breaking and shifting of rock beneath the earth's surface. For hundreds of millions of years, the forces of plate tectonics have shaped the earth as the huge plates that form the surface move slowly over, under, past, and away from each other. Sometimes the movement is gradual. At other times, the plates are locked together, unable to release the accumulating energy as they bend or stretch. When the forces grow strong enough, the plates suddenly break free causing the ground to shake. Most earthquakes occur at the boundaries where two plates meet; however, some earthquakes occur in the middle of plates.

Aftershocks are smaller earthquakes that follow the main shock and can cause further damage to weakened buildings. Aftershocks can occur in the first hours, days, weeks, or even months after the quake. Some earthquakes are actually foreshocks that precede a larger earthquake.

What damage can earthquakes do?

Ground shaking from earthquakes can cause buildings and bridges to collapse; disrupt gas, electricity, and telephone services; and sometimes trigger landslides, avalanches, flash floods, fires, and tsunami. Buildings with foundations resting on unconsolidated landfill or other unstable soils are at increased risk of damage, as are homes not attached to their foundations.

In general, damage to buildings is the main cause of financial loss from earthquakes. Collapse of buildings is the main cause of casualties, either through crushing or entrapment. Loss of services is the main cause of people becoming displaced.

Earthquakes can cause damage in the following ways:

Strong ground shaking is nearly always the major cause of damage and injury, as all buildings close to the epicentre tend to sustain damage, even if it is relatively minor.

Fault rupture is a relatively rare cause of damage and injury. However, if a fault ruptures to the earth's surface, any building extending across it will be severely damaged.

Landslides. Strong ground shaking is a major cause of landslides in New Zealand. Factors affecting slope stability include the slope angle and height, slope modification, underlying geology, the history of landslides in the area and groundwater content. Properties above and below unstable slopes are also at risk from undermining and burial respectively. In the 1929 Murchison earthquake, 16 of the 17 fatalities were as a result of landslides.

Liquefaction occurs when saturated sandy ground is subjected to strong shaking; effects range from harmless 'sand boils' to serious ground damage such as subsidence. Liquefaction can cause substantial damage to buildings and underground equipment such as tanks and pipelines. Fortunately, not many areas of New Zealand have soils with high liquefaction potential.

Tsunami. Large earthquakes can generate tsunami if they cause major uplift of the sea floor, or trigger coastal or submarine landslides. Tsunami generated by local earthquakes are very dangerous as they can arrive at the nearest shore within minutes.

Fire. Post-earthquake fire is a highly variable phenomenon. Most earthquakes are not accompanied by fire, but devastating fires have occurred after earthquakes. In Napier, following the 1931 earthquake, much of the central business district was burned out and the loss due to the fire was about equal to the loss from the ground shaking. The 1906 San Francisco and 1923 Tokyo earthquakes caused fire losses that greatly exceeded the losses from ground shaking.

The critical factors in creating a fire risk are wind, water and weather. If the shaking is strong enough to disrupt the water supply, winds are strong enough to spread the fire across city streets and vegetation is flammable following hot, dry weather then the scene is set for a high level of fire risk.

How can I protect myself in an earthquake?

Ground vibrations during an earthquake are seldom the direct cause of death or injury. Most earthquake-related injuries and deaths result from collapsing walls and roofs, flying glass, and falling objects. It is extremely important for a person to move as little as possible to reach the place of safety he or she has identified, because most injuries occur when people try to move more than a short distance during the shaking.

Much of the damage caused by earthquakes is predictable and preventable. We must all work together in our communities to apply our knowledge to enact and enforce up-to-date building codes, retrofit older unsafe buildings, and avoid building in hazardous areas, such as those prone to landslides. We must also look for and eliminate hazards at home, at our children's preschools and schools, and in our workplaces. And we must learn and practice what to do if an earthquake occurs.

Action messages

Be prepared for an earthquake: protect yourself

CORE ACTION MESSAGES

► **Pick safe places in each room.**

► **Practice drop, cover and hold.**

For general preparedness, every household should create and practice a Household Emergency Plan and assemble and maintain Emergency Survival Items and a Getaway Kit. In addition, every household should take earthquake-specific precautions and plan and practice what to do in the event of an earthquake.

If you are at risk from earthquakes, you should:

1. Discuss with members of your household the possibility of earthquakes and what to do to stay safe if one occurs. Knowing how to respond will help reduce fear.
2. Develop an emergency communication plan in your family (for all hazards) in case family members are separated from one another during an earthquake, such as during the day when adults are at work and children at school. Have a plan for getting back together.
3. Pick safe places in each room of your home and your office or school. A safe place could be under a piece of furniture, such as a sturdy table or desk, or against an interior wall away from windows, bookcases, or tall furniture that could fall on you. The shorter the distance to your safe place, the less likely it is that you will be injured by furniture or fixtures that can become flying debris during the shaking. Injury statistics show that persons moving as little as three metres during an earthquake's shaking are more likely to experience injury than those who don't move that far.
4. Practice drop, cover, and hold in each safe place. Drop to the floor, take cover under a sturdy piece of furniture, and hold on to a leg of the furniture. If suitable furniture is not nearby, sit on the floor next to an interior wall and cover your head and neck with your arms. Responding quickly in an earthquake may help protect you from injury.
5. Practice drop, cover, and hold on at least twice a year.
6. Keep a torch and sturdy shoes by each person's bed.
7. Talk to your local council to identify safe outdoor assembly areas in your neighbourhood.
8. Inform guests, babysitters, and caregivers of earthquake plans. Everyone in your home should know what to do if an earthquake occurs, even if you are not there at the time.

Protect your property

CORE ACTION MESSAGES

- **Make sure your home and critical buildings are securely anchored to their foundations.**
- **Secure heavy objects both inside and outside the home.**

If you are at risk from earthquakes, you should:

9. Make sure your home is securely anchored to its foundation. Depending on the type of construction and the materials used in building your home, you may need to have it bolted or secured in another way to its foundation. If you are not sure that your home is securely anchored, contact a professional contractor. Buildings securely attached to their foundations are less likely to be severely damaged during earthquakes and become uninhabitable.
10. Bolt and brace hot water cylinders and gas appliances to wall studs. If the water heater tips over, the gas line could break, causing a fire hazard, and the water line could rupture. The water heater may be your best source of drinkable water following an earthquake. Consider having a licensed professional install flexible fittings for gas and water pipes.
11. Bolt bookcases, china cabinets, and other tall furniture to wall studs. Brace or anchor high or top-heavy objects. During an earthquake, these items can fall over, causing damage or injury.
12. Hang heavy items, such as pictures and mirrors, away from beds, couches, and anywhere people sleep or sit. Earthquakes can knock things off walls, causing damage or injury. Close picture hooks.
13. Brace overhead light fixtures. During earthquakes, overhead light fixtures may fall, causing damage or injury.
14. Install strong latches or bolts on cabinets. The contents of cabinets can shift during the shaking of an earthquake. Latches will prevent cabinets from opening and spilling out the contents. Place large or heavy objects on shelves near the floor.
15. Secure large items that might fall and break.
16. Store weed killers, pesticides, and flammable products securely in closed, latched metal cabinets.
17. Evaluate animal facilities and places your pets like to hide in, to ensure that any hazardous substances or structures are as safe as possible.
18. Consider having your building evaluated by a professional structural design engineer. Ask about home repair and strengthening tips for exterior features, such as porches, front and back decks, sliding glass doors, canopies, carports, and garage doors. This is particularly important if there are signs of structural defects, such as foundation cracks. Earthquakes can turn cracks into ruptures and make smaller problems bigger. A professional can give you advice on how to reduce potential damage.
19. Follow local seismic building standards and land use rules.

What to do during an earthquake

CORE ACTION MESSAGES

- **If you are outside, find a clear spot and drop to the ground.**
- **If you are inside when the shaking starts, move no more than a few steps to a safe place and drop, cover and hold.**

If you are inside when the shaking starts, you should:

20. Drop, cover, and hold on. Move only a few steps to a nearby safe place. Most people injured in earthquakes move more than three metres during the shaking.
21. If you are elderly or have limited mobility, remain where you are, bracing yourself in place.
22. If you are in bed, stay there, hold on, and protect your head with a pillow. You are less likely to be injured if you stay in bed. Broken glass on the floor can injure you.
23. Stay away from windows. Windows can shatter with such force that you can be injured by flying glass even if you are several metres away.
24. Stay indoors until the shaking stops and you are sure it is safe to exit. In most buildings in New Zealand, you are safer if you stay where you are until the shaking stops. If you go outside after shaking stops, move quickly away from buildings to prevent injury from falling debris.
25. Be aware that fire alarm and sprinkler systems frequently go off in buildings during an earthquake, even if there is no fire. Check for and extinguish small fires, and exit via the stairs.
26. If you are in a coastal area, drop, cover and hold on during an earthquake and then move immediately to higher ground when the shaking stops or, if the area is flat move as far inland as possible. Earthquakes off the coast can generate tsunami.

If you are outdoors when the shaking starts, you should:

27. Find a clear spot away from buildings, trees, streetlights, and power lines.
28. Drop to the ground and stay there until the shaking stops. Injuries can occur from falling trees, streetlights, power lines, and building debris.
29. If you are in a vehicle, pull over to a clear location, stop, and stay there with your seatbelt fastened until the shaking stops. Trees, power lines, poles, street signs, overpasses, and other overhead items may fall during earthquakes. Stopping in a clear location will reduce your risk, and a hard-topped vehicle will help protect you from flying or falling objects. Once the shaking has stopped, proceed with caution. Avoid bridges or ramps that might have been damaged by the quake.
30. If you are in a mountainous area or near unstable slopes or cliffs, be alert for falling rocks and other debris that could be loosened by the earthquake. Earthquakes often trigger landslides.

What to do after an earthquake

CORE ACTION MESSAGES

- **Expect aftershocks.**
- **Check yourself and then others.**
- **Look for fires.**

When the shaking stops, you should:

31. Expect aftershocks. Each time you feel one, drop, cover, and hold on. Aftershocks frequently occur minutes, days, weeks, and even months following an earthquake.
32. Check yourself for injuries and get first aid if necessary before helping injured or trapped persons.
33. Put on long pants, a long-sleeved shirt, sturdy shoes, and work gloves to protect yourself from injury by broken objects.
34. Look quickly for damage in and around the building and get everyone out if it appears unsafe as aftershocks following earthquakes can cause further damage to unstable buildings. Use the stairs, not an elevator. When you leave the building move to the nearest safe outdoor assembly area in your neighbourhood.
35. Listen to a portable, battery-operated radio for updated emergency information and instructions. If the electricity is out, this may be your main source of information. Local civil defence emergency management officials will provide the most appropriate advice for your particular situation.
36. Check the telephones in your home or workplace. If a phone was knocked off its cradle during the shaking of the earthquake, hang it up. Allow 10 seconds or more for the line to reset. If the phone lines are undamaged, you should get a dial tone. Use a telephone or cell phone only to make a brief call to your Household Emergency Plan contact and to report life-threatening emergencies. Telephone lines and cellular equipment are frequently overwhelmed in disaster situations and need to be clear for emergency calls to get through. Cellular telephone equipment is subject to damage by quakes and cell phones may not be able to get a signal, but regular land lines may work.
37. Look for and extinguish small fires. Fire is the most common hazard following earthquakes.
38. Clean up spilled medications, bleach, or flammable liquids immediately.
39. Open closet and cabinet doors cautiously. Contents may have shifted during the shaking and could fall, creating further damage or injury.
40. Help people who require special assistance – infants, elderly people, those without transportation, families who may need additional help in an emergency situation, people with disabilities and the people who care for them.
41. Watch out for fallen power lines or broken gas lines, and stay out of damaged areas. Hazards caused by earthquakes are often difficult to see, and you could be easily injured.

42. Keep all your animals under your direct control. Pets may become disoriented, particularly if the disaster has affected scent markers that normally allow them to find their way home. Pets may be able to escape from your house, and fencing may be broken. Be aware of hazards at ground level, such as debris and spilled chemicals. Be aware also that the behaviour of pets may change dramatically after an earthquake. They may become more aggressive or defensive. Take measures to protect the animals from hazards, and to protect other people from animals also.
43. The behaviour of livestock may change dramatically after a disruption. Be aware of their well-being and ensure they are secure, have food, water and are safe.
44. Stay out of damaged buildings. Damaged buildings may be destroyed by aftershocks following the main quake.

If you were away from home during the earthquake, return only when authorities say it is safe. When you return home:

45. Be alert for and observe official warnings.
46. Use extreme caution. Check for damage outside your home or critical buildings. Then, if the structures appear safe to enter, check for damage inside. Building damage may have occurred where you least expect it. Carefully watch every step you take. Get out of the building if you think it is in danger of collapsing. Do not smoke; smoking in confined areas can cause fires.
47. Examine walls, floors, doors, staircases, and windows.
48. Check for gas leaks. If you smell gas or hear a blowing or hissing noise, open a window and get everyone out quickly. Turn off the gas, using the outside main valve if you can, and call the gas company from a neighbour's home. If you turn off the gas for any reason, it must be turned back on by a professional.
49. Look for damage to the electrical system. If you see sparks or broken or frayed wires, or if you smell burning insulation, turn off the electricity at the main fuse box or circuit breaker. If you have to step in water to get to the fuse box or circuit breaker, call an electrician first for advice.
50. Check for damage to sewage/effluent and water lines. If you suspect sewage lines are damaged, avoid using the toilets and call a plumber. If water pipes are damaged, contact the water company and avoid using water from the tap. You can obtain safe water from undamaged water heaters or by melting ice cubes.
51. Watch for loose plaster, wall cladding, and ceilings that could fall.
52. If farming, check livestock access to fresh water as well as their general welfare. Check fences to ensure livestock are secure.

Insurance

If your property sustains any damage:

53. Residential property damage caused by earthquakes is covered by Earthquake Commission (EQC) insurance **providing** you already have house

and/or contents insurance. If your property has been damaged, lodge a claim by calling 0800 326 243 or visit www.eqc.govt.nz.

54. If the value of damage to your property exceeds the limit of EQC cover, ring your insurer as soon as possible. In almost all cases the insurance company will send an insurance assessor to look at your property. They will confirm what repairs and replacements are needed and covered by your policy.
55. Photograph or video record your damaged property.
56. List the damage to your property and belongings.
57. If your insurance policy covers you for loss of perishable goods, make a list of all the foods you throw away. Include anything in your fridge or freezer ruined by loss of power.

Ask the insurance company:

58. How long it will be before the assessor visits.
59. If they will provide you with temporary accommodation. This could be a nearby motel, bed and breakfast, a static caravan or a rented house.

Things to help with your insurance claim:

60. Confirm the insurance company will pay for any service or equipment you need.
61. Make a note of all telephone calls. Record the date, name and what was agreed.
62. Keep copies of all letters, emails and faxes you send and receive.
63. Keep receipts.
64. Don't throw anything away until told (except ruined food).
65. Depending on your policy, the insurance company may only offer to clean and repair something, not replace it.
66. If you rent your property, contact your landlord and your contents insurance company as soon as possible.
67. If you do not have insurance, your local council should be able to provide information on hardship grants or charities that may be able to help you.

Earthquakes general information

Media and community education ideas

Ask your community to adopt and enforce up-to-date building codes. Building codes are the public's first line of defence against earthquakes. National building codes are available to communities and regions. These codes identify construction techniques for buildings that help them withstand earthquakes without collapsing and killing people. Codes are updated regularly to make use of information learned from recent damaging earthquakes, so adopting and enforcing up-to-date codes is essential.

If your area is at risk from earthquakes, ask your local newspaper or radio or television station to:

68. Present information about how to respond if an earthquake occurs.
69. Do a series on locating hazards in homes, workplaces, day care centres, schools, etc.
70. Provide tips on how to conduct earthquake drills.
71. Run interviews with representatives of the gas, electricity, and water companies about how individuals should prepare for an earthquake.

Fiction and facts

Fiction: During an earthquake, you should get into a doorway for protection.
Fact: In modern homes, doorways are no stronger than any other part of the structure and usually have doors that will swing and can injure you. During an earthquake, you should get under a sturdy piece of furniture and hold on.

Fiction: During an earthquake, the earth cracks open and people, cars, and animals can fall into the cracks.
Fact: The earth does not crack open like the Grand Canyon. The earth moves and rumbles and, during that movement, small cracks can form. The usual displacements of the earth during an earthquake are caused by up-and-down movements, so shifts in the height of the ground are more likely than chasm-like cracks.

Fiction: Animals can sense earthquakes and give advanced warning.
Fact: Animals may be able to sense the first low-frequency waves of an earthquake that occurs deep within the earth, but the damage-causing primary and secondary waves follow just seconds behind. Animals do not make good earthquake warning devices.

Fiction: Big earthquakes always happen in the early morning.
Fact: Several recent damaging earthquakes have occurred in the early morning, so many people believe that all big earthquakes happen then. In fact, earthquakes occur at all times of day.

Fiction: It's hot and dry – earthquake weather!
Fact: Many people believe that earthquakes are more common in certain kinds of weather. In fact, no correlation with weather has been found. Earthquakes begin many kilometres below the region affected by surface weather. People tend to notice earthquakes that fit the pattern and forget the ones that do not. In all

regions of the world, “earthquake weather” tends to be whatever type of weather prevailed at the time of the region’s most memorable earthquake.

Fiction: We have good building codes so we must have good buildings.
Fact: New Zealand’s building codes are among the world’s best, and as a result modern (post-1980) buildings are most unlikely to collapse in even the strongest earthquake shaking. However, there are no grounds for complacency. The majority of our buildings were constructed before 1980, and even though these are unlikely to collapse, many of them, along with essential services, will be so badly damaged in a large earthquake as to be unusable. For this reason New Zealand’s cities could be rendered non-functional by earthquake damage to buildings, their contents and to infrastructure.

Fiction: Scientists can now predict earthquakes.
Fact: Scientists do not know how to predict earthquakes, and they do not expect to know how to any time in the foreseeable future. However, based on scientific data, probabilities can be calculated for potential future earthquakes.

Fiction: “Triangle of life” advice has replaced “Drop, cover and hold”.
Fact: Drop, cover and hold is the best advice for New Zealand conditions where falling objects present a real threat.

Useful links

- www.getthru.govt.nz
- www.gns.cri.nz
- www.geonet.org.nz
- www.eqc.govt.nz
- www.teara.govt.nz (search for ‘earthquakes’)
- www.rural-support.org.nz/
- www.maf.govt.nz/mafnet/rural-nz/adverse-events/

Useful numbers

Your important emergency household plan telephone numbers. Fill this out and keep this leaflet with your emergency items.

Contact	Details
Local authority emergency helpline	
Insurance company 24-hour	
Insurance number and policy number	
Local radio station (Frequency)	
School	
Family and neighbours	
Bank phone number and details	
Work phone numbers	
Medical Center/GP	
Local police station	
Vet/kennel/cattery	
Local hotel or B&B	
Gas supplier and meter number	
Electricity supplier and meter number	
Water supplier and meter number	
Electrician	
Plumber	
Builder	